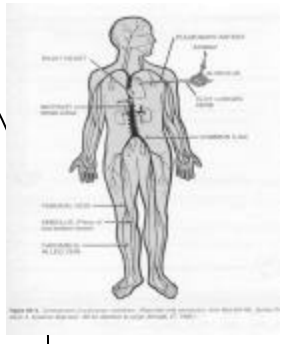
Problem Identification:

1. Pulmonary Embolism- is occlusion of a portion of the pulmonary vascular bed by an embolus : thrombus, tissue fragment, fats,or air bubble. The most common emboli are thrombi dislodged from the deep veins in the calf and also the pelvis (McCance, K & Huether, S.E. 1998).



Problem Identification Cont:

a. What risk factors for the development of a pulmonary embolus are present in this patient?

- Obesity (BMI 31)
  A BMI of 27 or > indicates obesity (Jarvis , C., 2000).
- Age 78 (advanced age)
- CAD
- Estrogen Therapy
- Immobility (obesity & RA)

Problem Identification Cont:

1. b. What objective and subjective evidence is suggestive of a pulmonary embolus?

- Subjective: "I have this persistent chest pain with breathing over the last day or so."
- Objective: P:90; RR:22; + V/Q lung scan; + Pulmonary angiogram along with ABG pH 7.47, Pco2 40, Po2 81, bicarb 29 on 2Ll

Desired Outcome:

2. What are the pharmacotherapeutic goals for this patient?

- To relieve symptoms (dyspnea, CP)
- Inhibit the progression of the embolus
- To prevent recurrence of PE
- To prevent mortality/reduce morbidity
- To minimize adverse effects, cost and hospital stay.

Therapeutic Alternatives:

3. What feasible alternatives are available for the treatment of PE?

Non-pharmacologic

Pulmonary Embolectomy (Surgical or Catheter)- Has role in patients with massive PE in whom thrombolysis is contraindicated (Tai, N.R.M., Atwal, A.S. & Hamilton, G., 1999).

Therapeutic Alternative Cont:

Inferior vena cava- indicated for recurrent embolism despite adequate anticoagulation, relative contraindication to anticoagulant tx,or ident.of free floating thrombus

(Church,V.,2000; Tai, N.R.M, Atwal, A.S.& Hamilton G., 1999; Ballew, K.A., Philbrick, J.T. & Becker, D.M., 1995).

Pharmacotherapeutics

Thrombolytic Therapy- indicated in patients with massive life-threatening embolism

(McCance, K.L. & Huether, S.E., 1998).

Optimal Plan:

4. Outline an appropriate pharmacotherapeutic plan for the management of this patient's condition.

Discontinue Aspirin esp. r/t h/o PUD -can increase the risk of bleeding if taken with Coumadin (Zieve, P.D.& Waterbury, L, 1999; Ross-Flanigan, N.,1999; Blessing, J.D.et. al, 1998).

Optimal Plan cont:

Start IV Heparin immediately- use weight-based heparin nomograms. Achieves therapeutic anticoagulation more rapidly than a standard care nomogram.

Initial bolus dose: 80U/kg

Maintenance infusion: 18U/kg/hour

Heparin infusion adjustments done by sliding scale until APTT therapeutic range (46 to 70 sec) (Hirsh, J.et. al, 1998; Coyne,N.R., 1997; Raschke, et. al, 1993).

Optimal Plan cont:

- Warfarin - It is recommended that Warfarin Rx be initiated during the 1st day of heparinization & treatment with both warfarin & heparin overlap to prevent break in therapeutic level
  (Coyne, N., 1997; Wells, B., Dipiro, J., Schwinghammer & T., Hamilton, C.,2000).

Optimal Plan Cont:

- Initial dose(5mg/d for 2-4 days)
- Elderly patients (>65) may need lower initial doses (1-3mg/d)
  (Wells, B., Dipiro, J., Schwinghammer & T., Hamilton, C., 2000; Hirsh, J. et. Al, 1998).

Assessment Parameters:

5. a. How should anticoagulant therapy be monitored for efficacy and adverse effects?

   APTT, PT,CBC prior to starting infusion

   Stat APTT 6 hours after initial bolus and 6 hours following any dose change

   CBC with platelet count q 3 days

   (Coyne,N., 1997; Raschke, R.A.,1993).

   PT and INR every 24-48 hours after therapy is initiated until the INR is stable (2.0 to 3.0) or until a maintenance dose is determined

   (Wells, B., Dipiro, & Hamilton, C., 2000).

A weight-based nomogram was used to determine an initial heparin bolus and infusion dose. Heparin dosing during the first 4 days of hospital stay was as follows:

Day	aPTT (sec)	aPTT Ratio	Time (hh:mm)	Heparin Bolus (U)*	Heparin Infusion Rate (U/h*)	Actions Taken
1	30	1.0	10:00	6400	1400	Recheck aPTT in 3 h
	36	1.2	13:00	3200	1600	Recheck aPTT in 9 h
	89	3.0	22:00	0	1200	Recheck aPTT with a.m. labs
2	37	1.2	05:00	3200	1400	Recheck aPTT in 6 h
	66	2.2	11:00	0	1400	Recheck aPTT in 6 h
	64	2.1	17:00	0	1400	Recheck aPTT in a.m.
3	60	2.0	05:00	0	1400	Recheck aPTT with a.m. labs
4	67	2.2	05:00	0	1400	Recheck aPTT with a.m. labs

* U, Units; # U/h, Units per hour

After 5 days of heparin therapy, warfarin therapy was initiated at 7.5 mg po once daily. The warfarin dose was subsequently adjusted to achieve an INR between 2.0 and 3.0. On the tenth hospital day, an INR of 2.65 was achieved, and the heparin infusion was discontinued. The patient was discharged on her initial med-

Assessment Parameters Cont:

- After 5 days of heparin therapy, warfarin therapy was initiated at 7.5 mg po once daily. The warfarin dose was subsequently adjusted to achieve an INR between 2.0 and 3.0. On the tenth hospital day, an INR of 2.65 was achieved, and heparin was discontinued. The patient was discharged on her initial medications plus warfarin 5 mg on Monday, Wednesday, and Friday and 2.5 mg on Tuesday, Thursday, Saturaday, and Sunday.

Assessment Parameters Cont:

5. b. What is your assessment of the appropriateness of these interventions?

The patient was dosed according to weight based heparin nomogram initially. Based on the literature : APTT was checked too early; On day 1 with APTT 89 the hep. Infusion should have been stopped for one hour and decreased by 3U/kg/h or not interrupted and just decreased by 2U/kg/h. (Hirsh, J. et. Al., 1998; Coyne, N.R.,1997; Raschke, R.A. et al., 1993).

Assessment Parameters Cont:

- The initial dose of warfarin was high according to the literature esp. for the elderly (> 65).
- This method of dosing maybe difficult for the elderly patient who takes several other medications .
- Effective warfarin admin can be achieved using a single tablet strength and alternating fractions or multipes of that tablet on given days of the week rather than on odd or even days (Horton, J. & Bushwick, B.M., 1999).

Patient Counseling:

6. What important issues about warfarin therapy should be discussed with the patient?
   - Strict Compliance
   - Side Effects
   - Dietary Instruction
   - Frequent prothrombin times
   - Drug interactions